New Header to be Inserted on Page 1, before line 1:

--CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority to British Patent Application No. 0028300.2 filed 21 November 2000

BACKGROUND OF THE INVENTION

Replacement paragraph to be Inserted into Page 1:

The invention to which this application relates is to the use of amplitude gain control in the receiving and processing of digital and/or analogue radio frequency (RF) signals by broadcast data receivers. Broadcast data receivers are typically used in conjunction with a television set and/ or the components thereof and can also be provided as an integral part thereof. The broadcast data receiver is provided to receive video and audio data carried on said analogue and digital signals, process the same and generate audio and or video for the television or radio programs for the user. The programs are typically carried on various selectable television channels and the data is carried on RF signals over a frequency range. The receiver typically includes one or a number of tuners which allow the receiver to tune to a particular frequency in response to a user selection of a particular channel.

Replacement Paragraphs to be Inserted into Page 2:

Further, there is usually no input tracking filter as part of the tuner. The result is that the RF amplifier, mixer IF (intermediate frequency) stages and A/D (analogue to digital converter) are subject to adjacent channel signal frequencies – often the whole transponder's content, and this can severely affect the quality of the selected signal frequency which is used for subsequent processing and generation of television programs and, in due time, affect the quality of generation of the television program for the user.

Replacement Page to be Inserted into Page 3:

The aim of the present invention is therefore to provide apparatus and a method whereby the received signal quality can be optimized for each particular receiver and at a particular location and with respect to a particular channel.

In a first aspect of the invention there is provided a system for the generation of television programs selected from a plurality of television channels said system including a broadcast data receiver, said receiver provided to receive any or any combination of analogue and /or digital data signals at a series of different frequencies, said signals carrying data which when received and processed by the receiver allows the generation of television programs which are displayed to a user, said broadcast receiver including a tuner and first and second AGC's which allow the adjustment of first and second gain levels when receiving a signal and characterized in that, when a signal frequency is selected in response to the user selection of a television channel to be generated by the receiver, the receiver tunes to the required frequency, receives the signal and the

Header to be inserted into Page 3

SUMMARY OF THE INVENTION

Replacements Paragraphs to be Inserted into Page 4:

Typically, the optimization and setting of the gain control levels is performed for each new signal frequency selected when a new channel is selected by the receiver user.

Preferably the optimization process is repeated either continuously or at regular intervals. This is the case even when the channel remains unchanged so as to take into account any alterations in conditions at the receiver or in the transmission system during the selection of said signal frequency.

Replacement Paragraphs to be Inserted into Page 5:

any combination of analogue and /or digital data signals, said signals transmitted at different frequencies within a frequency range, said signals carrying data which when received and processed by the receiver allows the generation of audio and video for television programs which are displayed to a user via a television, said broadcast receiver including a tuner and first and second AGC's which allow the adjustment of first and second gain levels when receiving a signal and characterized in that when a signal frequency is selected in response to the user selection of a television channel to be generated by the receiver, the receiver tunes to the required frequency, receives the signal and the receiver then checks and, if necessary, adjusts the first and/or second gain levels to determine those appropriate gain levels which provide the optimum signal for that signal frequency at that instant.

Thus in accordance with the invention no prior knowledge of the parameter being analysed being analyzed to indicate the optimization of the signal quality, referred to as the metric, and such as the bit error rate BER, versus the control variable curve is required, other than it has a single optimum point and the invention provides for the dynamic control of the AGC characteristics of the multiplicity of AGC loops to optimize the received signal quality. In effect the receiver adapts to a particular receiver installation and adapts the signal receiving means to suit the particular location and hence provide the optimal signal reception characteristics on a signal by signal basis.

Replacement Pages to be Inserted into Page 6:

an alternative embodiment a complex multidimensional parameter maximization search is adopted (or any step in between).

An alternative method of optimization is to use a combination of the principles of 'fuzzy logic' and non-linear filters.

In one embodiment the optimization can be determined with respect to a particular value or characteristic, or metric, such as a bit error rate (BER), by altering the AGC values and hence arriving at the AGC value or values which provide the optimal signal quality at a particular frequency.

Replacement Pages to be Inserted into Page 7:

and used to generate video and audio for a television or radio program by a broadcast data receiver connected to a display screen and speakers, said method comprising receiving a user selection of a particular television channel via the broadcast data receiver, identifying the signal frequency for that channel and tuning the receiver utilizing a tuner to receive the frequency signal, and characterized in that upon signal frequency reception adjusting at least first and second amplitude gain control levels and assessing the change in signal quality, said quality determined with respect to predefined parameters, and, upon identifying the optimum signal maintaining those amplitude gain control levels.

Typically upon selecting signal frequency reference is made to a storage means in which previous amplitude gain control levels for that signal frequency are held and which are utilized as the first settings for the signal frequency reception.

Header to be Inserted into Page 7

BRIEF DESCRIPTION OF THE DRAWINGS

Header to be Inserted into Page 8

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Replacement Paragraph to be Inserted into Page 9:

In accordance with the invention therefore, the quality of the selected signal is maximized using a process which is effective once the signal is selected and utilizes manipulation of the RF and IF gain levels and distribution. In the simplest example illustrated there are two (or more) predefined gain balances and the best gain balance is chosen based upon the level of the received signal data bit error rate (BER) in terms of a digital data signal.

Replacement Paragraphs to be Inserted into Page 10:

optimization of the selected signal quality improves the operational margin of the receiving system, so any further system degradation can be better tolerated. In use, adjustment of the AGC threshold control voltages changes the balance of the gain distribution between the RF and IF gain controlled stages 2,4 to optimize performance for the particular signal frequency situations found when the same are selected.

However, if, upon checking, the system finds that there are no significant adjacent frequency signals then it is better to maximize the baseband IF gain 22 to make best use of the

Replacement Paragraphs to be Inserted Into Page 11

Thus, in accordance with the invention, the system and optimization method is applied at least for every selection of a frequency signal in response to a user channel selection at the broadcast data receiver and preferably continuously or periodically refreshed for best performance during the reception of a particular frequency signal. Also, it is advantageous to learn and store the optimal settings for a given frequency and band which will then act as the new default setting for the frequency signal when it is next selected. However the system and method will still be employed but the resulting search effort required on reacquisition of a previously selected signal frequency is reduced.

Referring now to Figures 3-8 a more detailed example of a method and system which can be used to optimize a frequency signal is described. In this case a satellite transmission system installation is provided and is found to be operating in a sub optimal manner, perhaps due to poor reception and/or a wide variation of frequency signal levels within the 'visible' frequency range. The invention allows this system to be more tolerant of further signal degradations (e.g rainfall) upon satisfactory operation of the receiver system.

Replacement Paragraphs to be Inserted Into Page 12

'O'. The gradient around this point shows which way to change the control variable to get closer to the optimum i.e the minima of the curve. As the gradient reduces, the amount by which the control variable should be changed should be also reduced so that the optimum point is not stepped over.

Replacement Paragraph to be Inserted into Page 14:

The invention although described with reference to the method to optimize the AGC take-over point against the measured metric of the bit error rate (BER) for a demodulator and which gives the best BER depending on whether it was limited by the tuner noise-figure, adjacent channel interference or intermodulation products (Ips), can be extended to several other control loops within a product, e.g setting the correct black level. All of these have metric vs. control value curves that are non-constant, and have noisy metrics.

New Paragraph for Page 14 to be Inserted After the Last Line:

While the invention has been described with a certain degree of particularly, it is manifest that many changes may be made in the details of construction and the arrangement of components without departing from the spirit and scope of this disclosure. It is understood that the invention is not limited to the embodiments set forth herein for purposes of exemplification, but is to be limited only by the scope of the attached claim or claims, including the full range of equivalency to which each element thereof is entitled.

Clean Version of the Claims

1. (Amended) A system for the generation of television programs selected from a plurality of television channels said system comprising:

signals carrying data;

a broadcast data receiver, said receiver provided to receive any or any combination of analogue and /or digital data signals at a series of different frequencies and to process the data to allow[, said signals carrying data which when received and processed by the receiver allows] the generation of television programs which are displayed to a user, said broadcast receiver further including,

a tuner;

first and second amplitude gain controls which allow the adjustment of first and second gain levels when receiving a signal;

when a signal frequency is selected in response to the user selection of a television channel to be generated by the receiver, the broadcast data receiver tunes to the required frequency, receives the signal and the broadcast data receiver then adjusts the first and/or second gain levels to determine the appropriate gain levels which provide the optimum signal for that signal frequency with regard to predefined parameters.

2 (Amended) A system according to claim 1 wherein the optimization and setting of the gain control levels is performed for each new signal frequency selected when a new channel is selected by the broadcast data receiver user.

3. (Amended) A system according to claim 1 wherein the optimization process is repeated at regular intervals.

4. (Amended) A system according to claim 1 wherein the setting of the amplitude gain control levels is checked continuously.

5. (Amended) A system according to claim 1 wherein said broadcast data receiver further includes,

storage means in which previously selected settings for particular signal frequencies are stored and which are referred to when that signal is again selected to be received, with the

receiver setting the receiving parameters in accordance with those stored in the storage means and then starts from those settings when subsequently checking to ascertain whether those settings are providing the optimum signal reception at that instant.

6. (Amended) A system according to claim 5 wherein at the time of factory setting of said broadcast data receiver standard settings may be input into said storage means to provide a starting point for each signal frequency from which said broadcast data receiver tuner commences when the signal frequency is first chosen in use.

7. (Amended) A system according to claim 1 wherein upon the first selection of any signal frequency a series of common default settings are referred to by said broadcast data receiver.

8. (Amended) A system according to claim 1 wherein the signal quality is determined with reference to the demodulator error correcting circuitry in broadcast data receiver.

9. (Amended) A system according to claim 1 wherein the signal quality and optimization process is determined with respect to the bit error rate for the signal frequency.

10. (Amended) A system according to claim 9 wherein said bit error rate is adjusted by altering the first and second values of the amplitude gain values and hence arriving at the amplitude gain control value or values which provide the optimal signal quality at a particular signal frequency.

11. (Amended) A broadcast data receiver, said receiver comprising:

means to receive any or any combination of analogue and /or digital data signals transmitted at different frequencies within a frequency range and carrying data which when received and processed by the receiver allows the generation of audio and video for television programs which are displayed to a user via a television;

a tuner;

first and second amplitude gain controls which allow the adjustment of first and second gain levels when receiving a signal; and

when a signal frequency is selected in response to the user selection of a television

channel to be generated by the receiver, the receiver tunes to the required frequency, receives the signal and the receiver then checks and, if necessary, adjusts the first and/or second gain levels to determine those appropriate gain levels which provide the optimum signal for that signal frequency at that instant.

12. (Amended) A receiver according to claim 11 wherein the signal quality for each amplitude gain control level is measured by demodulator error correcting circuitry in said broadcast data receiver.

13. (Amended) A receiver according to claim 11 wherein the value which is measured is subject to control alterations to said broadcast data receiver.

14. (Amended) A receiver according to claim 11 wherein there are two or more amplitude gain control loop levels and the alterations made to each are based upon that which provides the lowest received signal bit error rate for each.

15. (Amended) A receiver according to claim 11 wherein said broadcast data receiver implements a two dimensional search in the amplitude gain control range to minimize the bit error rate.

16. (Amended) A method for receiving a data carrier signal selected from one of a range of signal frequencies, said method comprising the steps of:

processing received data for use to generate video and audio for a television or radio program by a broadcast data receiver connected to a display screen and speakers;

receiving a user selection of a particular television channel via the broadcast data receiver;

identifying the signal frequency for that channel;

tuning the receiver utilizing a tuner to receive the frequency signal;

upon signal frequency reception, adjusting at least first and second amplitude gain control levels and assessing the change in signal quality, said quality determined with respect to predefined parameters; and

upon identifying the optimum signal, maintaining those amplitude gain control levels.

17. (Amended) A method according to claim 16 wherein upon selecting signal frequency

reference is made to a storage means in which previous amplitude gain control levels for that signal frequency are held and which are utilized as the first settings for the signal frequency reception.

18. (Amended) A method according to claim 16 wherein said method is repeated for every new frequency signal selection.

19. (Amended) A method according to claim 16 wherein said method is repeated continuously while the broadcast data receiver is operational.